

ASOS MODIFICATION NOTE 44 (for Electronics Technicians)

Engineering Division

W/OSO321:WW

SUBJECT	:	Automated Surface Observing System (ASOS) Thunderstorm Sensor
PURPOSE	:	Addition of a sensor to detect thunderstorms.
EQUIPMENT AFFECTED	:	DCP, ASOS Thunderstorm Sensor (ATS).
PARTS REQUIRED	:	Reference parts listed in Appendix A.
MODIFICATION PROCUREMENT	:	Parts (Appendix A) will be issued by National Weather Service Headquarters (NWSH). NWSH will issue one (1) ASOS Thunderstorm Sensor (S100-2A9) and one (1) Mounting Kit (S100-FMK-90) for each site listed in Appendix C.
SPECIAL TOOLS REQUIRED	:	None.
TIME REQUIRED	:	4 hours.
EFFECT ON OTHER INSTRUCTIONS	:	Modification Note 38 must be completed before or as part of this modification action.
AUTHORIZATION	:	This modification is authorized by ECP E96-SM05F181C.
VERIFICATION STATEMENT	:	This modification has been tested for operational integrity at the Field Systems Branch Facility, located at Sterling, VA, and sites listed in Appendix C (with asterisks).

GENERAL

This modification note provides the procedure for installation of the ATS. This device consists of four major components: antenna assembly, main enclosure, power/communications module, and an electronics module. Within the antenna assembly are an optical sensor and electric field antenna. These components in the antenna respond to optical impulses and changes in electromagnetic fields. The sensor's processor, within the electronics module, receives, evaluates and determines if the signal from the antenna constitutes any cloud-to-ground and cloud-to-cloud discharges within three range categories: 0-5 miles (overhead), 5-10 miles (near), and 10-30 miles (distant). The information is then reported to the Data Collection Package (DCP) via the communications module.

PROCEDURE

The installation instructions, found in Appendix B, are for installing the ATS.

BEFORE INSTALLING THUNDERSTORM SENSOR

1. Call the AOMC at 1-800-242-8194 and provide notification on which ASOS will have new hardware installed.
2. Get approval of the responsible MIC/OIC before starting installation. If restrictions in steps 3 and 4 are satisfied, installation may be done on any day of the month.
3. Commissioned sites only: Do not start installation during bad weather, precipitation, instrument flight rule (IFR) conditions, or if any of those conditions are expected within 3 hours. The responsible MIC/OIC will define those meteorological conditions.
4. The ATS installation will conflict with scheduled synoptic observations. Allow 4 hours to complete installation and restart ASOS. Also, inform the MIC/OIC/Observer that this condition will occur.
5. Immediately before work begins at NWS staffed sites, the MIC/OIC/Observer will inform the tower and any other critical users that ASOS will be shut off for thunderstorm sensor installation. At an unstaffed site, the electronics technicians (ET) will inform the tower using Controller Video Displays (CVD) and Operator Interface Devices (OID) to log off and shut down display power to avoid confusion.
6. At NWS-staffed sites, normal backup observing procedures will be implemented.
7. Make the appropriate SYSLOG entries (MAINT-ACT-FMK) Mod 44.
 - a. Log on as **TECH**.
 - b. Key the **MAINT** screen.
 - c. Key the **ACT** page.
 - d. Key **START** - Stop here and perform Mod 44. As described in Appendix B. Upon completion of the Mod 44, log onto the system.

AFTER INSTALLING THUNDERSTORM SENSOR

See page 3 for a description of the time required to reboot ASOS and sensor response times after power is reapplied to the ASOS.

8. When ASOS is restarted at unstaffed sites, call and inform the Air Traffic Control Towers (ATCT), using CVDs and OIDs, to turn their displays on. (At staffed sites, the MIC/OIC observer will call the ATCT).
9. If on-site NWS staff provided backup while the installation is underway, no special observation is needed when ASOS is restarted.

If there is no backup at a site and a record observation was missed during the installation, a special observation must be taken when ASOS is restarted. The electronics technician (ET) should take the following steps at the ASOS keyboard after installation:

- a. Press **SIGN**.
- b. Type his/her initials and press [RETURN].
- c. Type the observer level password and press [RETURN].
- d. Press **GENOB**.
- e. Press **SPECL**.
- f. Press **EXIT**.
- g. Press **SIGN**.
- h. Type his/her initials again and press [RETURN].
- i. Press [RETURN] twice. This will sign off the observer from the ASOS system.
- j. Leave ASOS running.

Note

The observer must sign off before the 5-minute edit time is up.

10. Inform the office staff that ASOS is again operational. If less than 25 minutes remain until the next hourly observation, augmentation of the ceiling may be required. Augmenting several elements or even the entire observation may be necessary. The chart below indicates how long it takes after a startup for ASOS to report each observation element automatically.

Times Needed for Elements to be Reported Automatically

Status Output	Minimum (minutes)	Maximum (minutes)
Precipitation Amount	1	*
Wind Direction	2	7
Wind Speed	2	7
Precipitation Type	2	*
Temperature	5	10
Dew Point	5	10
Visibility	10	15
Obstruction to Visibility	10	*
Ceiling	30	35

* Maximum time not applicable since phenomena may not be present. Minimum time applies if phenomena are present.

11. Verify that ASOS transmitted an hourly observation. Call the AOMC at 1-800-242-8194 and tell the operator:
 - a. Your location;
 - b. That installation of the thunderstorm sensor has been completed; and
 - c. That ASOS is operational.
12. Enter in the SYSLOG that maintenance has been completed.
 - a. Key the **MAINT** screen.
 - b. Key the **ACT** page.
 - c. Key **FMK** - Enter the Field Mod Kit (FMK) number as follows: **Mod 44**; On the second line of the screen verify that only **Mod 44** is displayed. Complete by entering **Y** in the Y/N area if only **Mod 44** is displayed. If other modifications are completed, make appropriate log entry or entries.
 - d. Check the **SYSLOG** and verify the **FMK** message. Enter a comment in the **SYSLOG** stating that the thunderstorm sensor was installed; and
 - e. Notify the AOMC via telephone that **Mod 44**, thunderstorm sensor installation and any other Mods have been completed.
13. At an expansion site with ATCT, the ET will contact the ATCT and supply information on the following:
 - a. ASOS maintenance is completed.
 - b. ASOS is restored to service.
 - c. Tower CVDs and OIDs need to be turned on, and TRACON displays need to be turned on.

Reporting Modification

Target date for completion of this modification is 15 days after receipt of parts. Report completed modification on Weather Service Form A-26 Maintenance Record, using instructions in Engineering Handbook Book No. 4, Part 2, Appendix F, using reporting code ATS. Add the serial number of the ATS installed.

Also, record the modification number in block 17a as **44** and the ECP number in block 17e as **F181C** (see Appendix D for a completed sample of WS Form A-26).

John McNulty
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Appendix A
Appendix B
Appendix C
Appendix D

PARTS LIST FOR THUNDERSTORM SENSOR INSTALLATION

Qty.	P/N	NOMENCLATURE
1 EA	62828-47014-90	Board, DCP SIO#3
5 EA	62828-90256-1	Cable Ties
1 EA	62828-40155-100	Circuit Breaker Module
10 FT	62828-90096-1	3/4" Flex Conduit
2 EA	62828-90097-1	Connector, Flex Conduit
1 EA	62828-90254-1	Connector, Split Bolt
1 EA	62828-42040-30	Fiber Optic Cable
1 EA	62828-90006-1	Fiber Optic Modem
1 EA	62828-90253-1	Lug
1 EA		18" Mounting Pole - 3" ID Pipe
1 EA		Mounting Pole Coupling - 3" (min) ID Pipe and Hardware
2 EA	62828-90293-1	O-Ring Gasket
4 EA	62628-90075-1	Screw, Metric
5 EA	62828-90132-11	Terminal Lug, Spade
1 EA	62828-90423-10	Thunderstorm Sensor
4 EA	MS35338-134	Washer, Lock
10 FT	QQW343S10S1B	Wire, 10 Gauge Solid Copper
5 EA		Wire 16 Gauge (5 @ 14 Ft Each), (1)Black, (1) White, (1)Green, (1)Red, (1)Yellow

INSTRUCTIONS

ASOS THUNDERSTORM SENSOR INSTALLATION**GENERAL**

This procedure describes the reconfiguration of the DCP to accommodate the ASOS thunderstorm sensor. The thunderstorm sensor requires a separate circuit breaker for the heater power and electronics power.

In conjunction with this modification note, Modification Note 38 (ACU firmware v2.49) must be installed to support the thunderstorm sensor. It is recommended to perform Modification Note 38 prior to installation of the thunderstorm sensor.

HARDWARE INSTALLATION PROCEDURE

1. Open the DCP door, set UPS power switch to 0 (**OFF**) position on Class II systems only, and turn **OFF** the UPS POWER CIRCUIT BREAKER A1A3A1.
2. Open the DCP power panel and turn **OFF** the DCP power. This will remove electronics power to the DCP and the sensors.
3. At the AC Junction Box, turn the Main Breaker (40 amp) to the **OFF** position. This will remove heater and electrical power to the DCP and the sensors.
4. In the DCP, install the thunderstorm sensor circuit breaker module (62828-40155-100) in slot A1A3A9, following the procedure found in Table 3.5.29 of the S100 Site Technical Manual (STM).
5. In the DCP, remove the blank panel from 2A1A2A6 and install Serial Input/Output (SIO) #3 board (62828-47014-90).

NOTE

Be sure to configure SIO#3 board jumpers with respect to page 2-177 of the S100 STM.

6. Open the DCP Faraday Box (A3) to access the sensor power wiring and the fiber optic modems.
7. Remove the blank cover from the A8 position on top of the Faraday Box (save the gasket).
8. Install fiber optic modem (62828-90006-1) and the gasket in position A8 using screws (62828-90075-1) and washers (MS35338-134).
9. Locate the SIO connector in the DCP harness marked A3A8J1. (This should be located in the cabling, directly behind the fiber optic modems on the top of the Faraday Box). Connect the SIO connector to the connector of the fiber optic modem, installed in position A8, and tighten to the top of the Faraday Box.

10. Remove protective plug from the 3/4-inch raceway in bottom of DCP cabinet.
11. Install flex conduit connectors (62828-90097-1) on both ends of the flex conduit (62828-90096-1). Before installing conduit to DCP or sensor, pull fiber optic cable (62828-42040-30) and power wiring harness (16 AWG black, 16 AWG white, 16 AWG red, 16 AWG yellow, and 16 AWG green wire) through the flex conduit. (Be sure to pull at least 18 inches of fiber optic cable and power wiring through the end of the conduit being attached to the DCP).
12. If not already marked, place markings of Transmit (TX) and Receive (RX) at both ends of the fiber optic cable. (Using a flash light will assist you in identifying and separating the fiber optic lines).
13. Remove retaining nut from one end of the flex conduit and install O-ring gasket (62828-90293-1) on connector. Feed fiber optic cabling and power wire harness through the 3/4-inch raceway in bottom of DCP cabinet. Connect the flex conduit to the DCP through the 3/4-inch raceway. The retaining nut MUST be installed on the inside of the DCP cabinet. Secure the flex conduit to the DCP cabinet by tightening the retaining nut.
14. Place the mounting pole coupling on the upper LEFT column supporting the DCP cabinet (the column without the antenna).

NOTE

The mounting pole and coupling may consist of more than one piece. Assemble as necessary.

- a. Remove the cap from the left pole.
 - b. Apply anti-seize compound to the threads on the left pole and thread the coupler onto the pole.
 - c. Apply anti-seize compound to the threads on the 18 inch pole extension and thread the extension into the coupler.
 - d. Apply anti-seize compound to the top threads on the extension. Re-attach the cap removed in step A to the top of the extension.
15. Install thunderstorm sensor S100-2MT7 (62828-90423-10) on the very top of the mounting pole using hardware supplied with sensor. Orient sensor so that the main enclosure door faces the same direction as the DCP cabinet door.

At the DCP:

NOTE

Refer to Table B1 (page B6) for Wiring Instructions

CAUTION

Fiber optic cables are delicate and should be handled with care.

16. Connect fiber optic cable marked TX and RX to fiber optic modem installed in position A8. Ensure that the TX and RX are properly connected.
17. Strip 1/4-inch insulation off of black wire and connect wire to terminal A17-10B.
18. Strip 1/4-inch insulation off of white wire and connect wire to terminal A18-10B.
19. Strip 1/4-inch insulation off of red wire and connect wire to terminal A17-10B.
20. Strip 1/4-inch insulation off of yellow wire and connect wire to terminal A18-10B.
21. Strip 1/4-inch insulation off of green wire and connect wire to terminal A18-4G.

At the Sensor:

22. Open ATS main enclosure door. Remove retaining nut from end of flex conduit and install O-ring gasket (62828-90097-1) on flex conduit. Feed the fiber optic cabling and power wiring through the 3/4-inch entry hole on the bottom of the sensor and connect the flex conduit to the bottom of the sensor. The retaining nut **MUST** be installed on the inside of the sensor. Secure flex conduit to sensor by tightening the retaining nut.

NOTE

Refer to Table B1 (page B6) for Wiring Instructions

23. Cut black wire to length, strip and install terminal lug (62828-90132-11) on wire and connect wire to P1-1.
24. Cut white wire to length, strip and install terminal lug (62828-90132-11) on wire and connect wire to P1-2.
25. Cut green wire to length, strip and install terminal lug (62828-90132-11) on wire and connect wire to P1-3.
26. Cut red wire to length, strip and install terminal lug (62828-90132-11) on wire and connect wire to P1-4.
27. Cut yellow wire to length, strip and install terminal lug (62828-90132-11) on wire and connect wire to P1-5.

28. Connect fiber optic cable to fiber optic modem making sure TX and RX are installed properly with respect to Table B1 (page B6).
29. Install lug (62828-90253-1) on 6-foot piece of 10 AWG solid wire (QQW343S10S1B). Connect wire to ground stud on sensor using hardware supplied with sensor. Connect other end of ground wire to system ground wire running along the top of the raceway using a split bolt connector (62828-90254-1).
30. Secure flex conduit and ground wire to sensor pole using Cable Ties (62828-90256-1).
31. Verify the ATS power switch (S1), located inside the sensor's main enclosure, is set to the **ON** position.
32. Verify the SW101 DIP Switch Bank settings, on the Processor Board, are in the correct positions with respect to Table B2 (page B6).
33. Verify the SW100 DIP Switch Bank settings, on the Processor Board, are in the correct positions with respect to Table B3 (page B7). (Do not close ATS main enclosure door at this time.)
34. Close Faraday Box and secure using existing hardware.
35. Set the ATS electronic's circuit breakers A1A3A9 (62828-90155-100) to the **ON** position. (The heater circuit breaker is not used at this time.)
36. Set UPS power switch to 1 (**ON**) position on Class II systems, and turn **ON** the UPS Power circuit breaker (A1A3A1).
37. At DCP power panel, turn DCP power switch to the **ON** position.
38. At the AC Junction Box, turn the Main Breaker (40 AMP) to **ON**. This will restore heater and electrical power to the DCP and the sensors.
39. Verify the following, on the Power/Comm board, inside the sensor's main enclosure:
 - a. Neon lamp, LP1, is lit (Right/center on board).
 - b. Neon lamp, LP2, is lit (Right/center on board).
 - c. Neon lamp, LP3, is **not** lit (Right/center on board) unless the temperature at the Power/Comm board is less than 32° F (0°C).
 - d. LED1 (12V) is lit (Right/top on board).
40. If all indicators demonstrate normal operation, close and secure ATS main enclosure door. If there is an indication of the sensor functioning improperly, contact Woody Weir at 301 713-1835 x129.
41. Close and secure DCP main enclosure door.

Configuration of System and Sensor:

CAUTION

If Modification Note 38 has not been performed, complete Modification Note 38 before proceeding.

1. On an OID, perform the following:

- a. Sign on OID as a TECHNICIAN.

Configuration of the System

- b. Press: REVUE - SITE - CONFIG - HDWE to get to the Hardware Configuration Screen.
- c. Press the CHANG key.
- d. Using the NEXT key, toggle to the SIO field and type **3** on the keyboard.
- e. Press the EXIT key. (The system is now configured.)

Configuration of the Sensor

- f. Press: REVUE - SITE - CONFIG - SENSR to get to the Sensor Configuration Screen.
- g. Press the CHANG key.
- h. Using the NEXT key, toggle to SIO #3 Port #1 field and type **TS** on the keyboard.
- i. Press the EXIT key. (The sensor is now configured.)

Operational Verification of the Thunderstorm Sensor

- j. On the One-Minute screen, in the Remarks field, verify there is **not** the symbol **TNO** (Thunderstorm sensor Not Operational).

If thunderstorm sensor is operational, the Remarks field will look like:
Remarks = (Blank)

- k. If **TNO** appears in the Remarks field, repeat steps 1b through 1i.
- l. Recheck One-Minute screen.
- m. If **TNO** reappears in the Remarks field, verify that the thunderstorm sensor installation was performed correctly (e.g. wiring, DIP switches).
- n. If **TNO** does not appear in the Remarks field, Modification Note 44 is complete.

WIRING INSTRUCTIONS

FROM	TO	WIRE No.	COLOR
THUNDERSTORM	DCP		
P1-1	A17-10B	5	BLACK
P1-2	A18-10B	5	WHITE
P1-3	A18-4G	5	GREEN
P1-4	A17-10B	5	RED
P1-5	A18-10B	5	YELLOW
TX	RX		FIBER OPTIC CABLE
RX	TX		FIBER OPTIC CABLE

Table B1 Wiring Chart for Thunderstorm Sensor

SW101 DIP SWITCH BANK

SW101 Switch	DIP Switch Position Right (Up) / Left (Down)	Output Mode Activated
1	Up	VT100 Terminal
2	Up	One-Minute Output
3	Up	Reserved - Always Leave UP
4	Up	Flash Message Output
5	Up	Simulator
6	Down	Host
7	Up	24-Hour History Message NOT Cleared
8	Up	Reserved - Always Leave UP

Table B2 SW101 DIP Switch Bank Positioning Chart

SW100 DIP SWITCH BANK

SW100 Switch	DIP Switch Position Right (Up) / Left (Down)	Output Mode Activated
1	Up	Diagnostic Test (Normal Operation)
2	Up	Diagnostic Test (Normal Operation)
3	Up	Diagnostic Test (Normal Operation)
4	Up	Reserved
5	Up	Unit of Measure (Miles)
6	Up	Unit of Measure (Miles)
7	Up	Flash Aging Interval (15 Minutes)
8	Up	Flash Aging Interval (15 Minutes)

Table B3 **SW100 DIP Switch Bank Positioning Chart**

The sites for the Thunderstorm Sensor are:

SID	CITY	STATE
ALS*	ALAMOSA	CO
APN	ALPENA	MI
AST	ASTORIA	OR
BFF*	SCOTTSBLUFF	NE
BKW	BECKLEY	WV
CAR	CARABOE	ME
CNK*	CONCORDIA	KS
CON	CONCORD	NH
EKN**	ELKINS	WV
ELY*	ELY	NV
FCA	KALISPELL	MT
HON**	HURON	SD
HTL	HOUGHTON LAKE	MI
HVR	HAVRE	MT
INL	INTERNATIONAL FALLS	MN
ISN	WILLISTON	ND
LND	LANDER	WY
OFK*	NORFOLK	NE
SHR	SHERIDAN	WY
SPS*	WICHITA FALLS	TX
STC	SAINT CLOUD	MN
TUP*	TUPELO	MS
VCT*	VICTORIA	TX
VTN	VALENTINE	NE
WMC	WINNEMUCCA	NV
Y62	SAULT STE. MARIE	MI

(*) Test sites used to validate the operational integrity of the thunderstorm sensor.

(**) Test sites used to validate the operational integrity of the thunderstorm sensor, however these sensors are being removed and returned to the National Reconditioning Center because the site does not require a thunderstorm sensor.

